CLAIMS

WHAT IS CLAIMED IS:

1. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor, said instructions being arranged to cause one or more processors upon execution thereof to perform the steps of:

(a) obtaining a data file comprising positional data and ground reaction force data for said plurality of animals traversing an instrumented force-sensing floor;

(b) dividing the positional data into a plurality of time zones, each time zone having a start time and an end time;

(c) determining whether each of said time zones represents positional data and ground reaction force data for a single limb or for multiple limbs;

(d) singulating multiple limb time zones into a plurality of separate single limb time zones;

(e) identifying each limb in each time zone as a fore limb or a hind limb and a left limb or a right limb;

(f) associating each identified fore and hind limb with a respective one of said plurality of animals.

2. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 1, wherein step (d) comprises singulating multiple limb time zones via induction into a plurality of separate single limb time zones.

3. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 2,

wherein the instructions arranged to cause one or more processors upon execution thereof to perform step (a) further comprises an instruction or instructions arranged to obtain identification data comprising at least one of time data for data recordation, file numbers, animal tag numbers, and animal identification numbers, and

wherein the instructions arranged to cause one or more processors upon execution thereof to perform step (a) further comprises an instruction or instructions arranged to calculate a number of animals recorded in each file.

4. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 3, wherein the instructions arranged to cause one or more processors upon execution thereof to perform step (b) further comprises an instruction or instructions arranged to find a first vector of indices for which a Y-position of a right limb or a left limb is greater than zero and a second vector of indices for which a Y-position of a right limb or a left limb is greater than one and to utilize at least one of said first vector of indices and said second vector of indices to determine said plurality of time zones.

5. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 4, wherein the instructions arranged to cause one or more processors upon execution thereof to perform step (c) further comprises an instruction or instructions arranged to determine a maximum and an average ground reaction force between a start time of a tested limb

time zone and an end time of a tested limb time zone if the difference between the start time and the end time is greater than about 30 seconds, and to store said maximum and said average ground reaction force.

6. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 5, wherein the instructions arranged to cause one or more processors upon execution thereof to perform step (c) further comprises an instruction or instructions arranged to determine said average ground reaction force by calculating a ratio of an impulse variable over a stancetime variable, said impulse variable calculated by applying a multiplier to a ground reaction force curve area defined between said start time of a tested limb time zone and said end time of a tested limb time zone, and said stancetime variable calculated as the difference in time between said start time of a tested limb time zone and said end time of a tested limb time zone.

7. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 6, wherein the instructions arranged to cause one or more processors upon execution thereof to perform step (c) further comprises an instruction or instructions arranged to calculate a slope of a running window of Y position values and to calculate a maximum slope, a minimum slope, and a respective time of said Y position values.

8. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 7, wherein the instructions arranged to cause one or more processors upon execution thereof to perform step (c) further comprises an instruction or instructions arranged to increment

a counter if the slope of said running window of Y position values is greater than about 2 or less than about -2.

9. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 8, wherein the instructions arranged to cause one or more processors upon execution thereof to perform step (c) further comprises an instruction or instructions arranged to increment a positive slope counter by one or to increment a negative slope counter if a slope within said running window exceeds a predetermined minimum rate of change.

10. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 9, wherein the instructions arranged to cause one or more processors upon execution thereof to perform step (c) further comprises an instruction or instructions arranged to run a loop wherein the ground reaction force slope is calculated for a second running window having a width less than that of said running window, and wherein a ground reaction force slope counter is incremented by one if the product of two successive ground reaction force slope values are negative.

11. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 10, wherein the instructions arranged to cause one or more processors upon execution thereof to perform step (c) further comprises an instruction or instructions arranged to calculate, for a difference in between the start time and the end time is greater than about 30 seconds, average Y position, maximum Y position value, minimum Y position value, maximum ground reaction force, and average ground reaction force.

12. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 11, wherein the instructions arranged to cause one or more processors upon execution thereof to perform step (c) further comprises an instruction or instructions arranged to calculate, a maximum slope and a minimum slope within a running window and to store said maximum slope and said minimum slope together with a respective time of occurrence for each of said maximum slope and said minimum slope.

13. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 12, wherein the instructions arranged to cause one or more processors upon execution thereof to perform step (c) further comprises an instruction or instructions arranged to assign a number of limbs in a time zone to be one if at least one of the following sets of conditions is satisfied comprising (1) a difference between a maximum and a minimum value of Y position is less than six, a difference between a mean value of Y position and a minimum value of Y position is less than six, said maximum slope is less than five, said minimum slope is greater than negative five, said ground reaction force slope counter is one; (2) said ground reaction force slope counter is one, said maximum slope is greater than or equal to five and the difference in time between said maximum slope and said start time is less than 20 seconds and said minimum slope is greater than negative five; (3) said ground reaction force slope counter is one, said maximum slope is greater than or equal to five, a difference in time between said end time and said time of the maximum slope is less than twenty seconds, and said minimum slope is greater than five; (4) said ground reaction force slope counter is one, said minimum slope is less than or equal to negative

five, a difference in time between said end time and said time of the minimum slope is less than twenty seconds, and said maximum slope is less than five; and (5) said ground reaction force slope counter is one, said minimum slope is less than or equal to negative five, a difference in time between said end time and said time of the minimum slope is less than twenty seconds, and said minimum slope is greater than five; and the maximum slope is less than five, (6) said ground reaction force slope counter is one, said minimum slope is less than or equal to negative five, a difference in time between said time of the minimum slope and said start time is less than twenty seconds, and said maximum slope is less than five, and (7) a difference between a maximum value of Y position and the average value of Y position is less than six, a difference between a mean value of Y position and a minimum value of Y position is less than six, said positive slope counter is less than 0.09 times the difference between said start time and said end time, and said negative slope counter is less than 0.09 times a difference between said start time and said end time.

14. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 13, wherein the instructions arranged to cause one or more processors upon execution thereof to perform step (c) further comprises an instruction or instructions arranged to assign a number of limbs in a time zone to be three if the following set of conditions is satisfied comprising a difference between a maximum value of Y position and the average value of Y position is greater than six, a difference between a mean value of Y position and a minimum value of Y position is greater than six, said maximum slope is greater than five, said minimum slope is less than negative five, said positive slope counter is greater than

0.09 times the difference between said start time and said end time, and said negative slope counter is greater than 0.09 times a difference between said start time and said end time.

15. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 14, wherein the instructions arranged to cause one or more processors upon execution thereof to perform step (c) further comprises an instruction or instructions arranged to assign a number of limbs in a time zone to be two if no set of conditions set forth in claim 13 or claim 14 is satisfied.

16. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 15, wherein the instructions arranged to cause one or more processors upon execution thereof to perform step (d) further comprises an instruction or instructions arranged to singulate a single ground reaction force signature for two limbs into two ground reaction force signatures for a single limb.

17. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 16, wherein said singulation step further comprises instructions arranged to cause one or more processors upon execution thereof to execute a first loop wherein a running window starts at the tested limb zone starting time and moves toward the limb zone end time to determine if a difference between a Y position at one end of the running window and a Y position at another end of the running window is greater than a predetermined threshold value and recording a y-value at the point at which the first loop is terminated, and to

execute a second loop wherein a running window starts at the tested limb zone ending time and moves toward the limb zone start time to determine if a difference between a Y position at one end of the running window and a Y position at another end of the running window is greater than a predetermined threshold value and recording a y-value at the point at which the second loop is terminated.

18. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 17, wherein said running window is 5 units wide.

19. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 18, wherein said singulation step further comprises instructions arranged to solve, for said single ground reaction force signature for two limbs, two simultaneous equilibrium equations to yield two separate ground force reaction signatures for two singulated limbs.

20. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 15, wherein the instructions arranged to cause one or more processors upon execution thereof to perform step (d) further comprises an instruction or instructions arranged to singulate a single ground reaction force signature for three limbs into three ground reaction force signatures for a single limb.

21. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 20, wherein said singulation step further comprises instructions arranged to cause one or more processors upon execution thereof to initiate, upon a first time the instructions for

singulation are executed, a first loop wherein a running window starts at the tested limb zone starting time plus a threshold of two and moves toward and up to a time at which a minimum Y position slope occurs in the tested limb zone minus a threshold of two, wherein an absolute value of a difference between said running window of two units wide and the Y position vector is evaluated and the loop is broken when said difference is less than two, and wherein a y-value at the point of said first loop termination is stored, and further instructions to execute a second loop wherein a running window starts at the time at which a minimum Y position slope occurs in the tested limb zone minus a threshold of two going backward to the starting time of the limb zone plus a threshold of two, wherein an absolute value of a difference between said running window of two units wide and the Y position vector is evaluated and the loop is terminated when said difference is less than two, and wherein a y-value at the point of said second loop termination is stored.

22. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 20, wherein said singulation step further comprises instructions arranged to cause one or more processors upon execution thereof to initiate a first loop wherein a running window starts at the time at which a minimum Y position slope occurs in the tested limb zone plus a threshold of two up to the end time of the limb zone minus a threshold of two, wherein an absolute value of a difference between said running window of two units wide and the Y position vector is evaluated and the loop is terminated when said difference is less than two, and wherein a y-value at the point of said first loop termination is stored, and to initiate a second loop wherein a running window starts at the tested limb zone end time minus a threshold of two units and moves backward to a time at which a minimum Y

position slope occurs in the tested limb zone minus a threshold of two units, wherein an absolute value of a difference between said running window of two units wide and the Y position vector is evaluated and the loop is broken when said difference is less than two, and wherein a y-value at the point of said second loop termination is stored.

23. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 21 or 22, said singulation step further comprises instructions arranged to solve, for said single ground reaction force signature for three limbs, two simultaneous equilibrium equations to yield two separate ground force reaction signatures for two singulated limbs.

24. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 23, said singulation step further comprises instructions arranged to solve, for said single ground reaction force signature for three limbs, at least a plurality of simultaneous equilibrium equations to yield a corresponding plurality of separate ground force reaction signatures for singulated limbs.

25. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 1, wherein the instructions arranged to cause one or more processors upon execution thereof to perform step (e) further comprises an instruction or instructions arranged to designate the tested limb as a fore limb if a tested limb zone belongs to a single limb and it is the first limb in the data sequence to be tested and to designate the limb data as indeterminate if the tested limb zone is of a single limb and the average Y position is greater than 72

inches end of the plate or if the tested limb zone is of a single limb and the average Y position is less than 1 inch the front end of the plate.

26. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 25, wherein the instructions arranged to cause one or more processors upon execution thereof to perform step (e) further comprises an instruction or instructions arranged to delineate a tested limb as a hind limb if any one of the following sets of conditions is satisfied: (1) the tested limbzone is of a single limb, the limb before the tested limb is fore, the limb before the tested limb is not adjacent an end of the plate, the limb before the tested limb is not adjacent a beginning of the plate, the average ground reaction force of the previous limb is greater than or equal to 1.04 times the average ground reaction force of tested limb and the difference between the average Y Position of the previous and current limb zones is less than five; (2) the tested limbzone is of a single limb, the limb before the tested limb is fore, the difference between the average Y Position of the previous and current limb zones is less than ten; (3) the tested limbzone is of a single limb, the limb before the tested limb is fore, the peak ground reaction force of the previous limb is greater 1.15 times the peak ground reaction force of a current limb; and (4) the tested limbzone is of a single limb, the limb before the tested limb is fore and the ground reaction force slope counter of the current zone is greater than three.

27. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 26, wherein the instructions arranged to cause one or more processors upon execution thereof to perform step (e) further comprises an instruction or instructions arranged to designate

the limb data as belonging to a fore limb if a tested limb zone belongs to a single limb, the limb before the tested limb is fore, the limb before the tested limb is not adjacent the end of the plate, the limb before the tested limb is not adjacent the beginning of the plate, and a difference between the average Y position of the previous and current limb zones is greater than or equal to five.

28. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 26, wherein the instructions arranged to cause one or more processors upon execution thereof to perform step (e) further comprises an instruction or instructions arranged to designate the tested limb as a fore limb if any one of the following sets of conditions is satisfied: (1) the tested limbzone is of a single limb and the limb before the tested limb is hind, the limb before the tested limb is not adjacent the end of the plate, the limb before the tested limb is not adjacent the beginning of the plate, the average ground reaction force of the previous limb is greater than 1.05 times the average ground reaction force of the tested limb, and the difference between the average Y Position of the previous and current limb zones is less than or equal to zero; (2) the tested limbzone is of a single limb, the limb before the tested limb is hind, the average ground reaction force of the previous limb is greater than 1.02 times the average ground reaction force of the current limb and the difference between average Y position of current and previous limbs is less than or equal to -15; (3) the tested limbzone is of a single limb, the limb before the tested limb is hind, the average ground reaction force of the previous limb is greater than 1.1 times the average ground reaction force of current limb; and (4) the tested limbzone is of a single

limb, the limb before the tested limb is hind, and the peak ground reaction force of the previous limb is greater than 1.1 the peak ground reaction force of the current limb.

29. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 26, wherein the instructions arranged to cause one or more processors upon execution thereof to perform step (e) further comprises an instruction or instructions arranged to designate the tested limb as a hind limb if any one of the following sets of conditions is satisfied: (1) the tested limbzone is of a single limb, the limb before the tested limb is hind, the limb before the tested limb is not adjacent the end of the plate, the limb before the tested limb is not adjacent the beginning of the plate and the average ground reaction force of the previous limb is less than or equal to 1.05 times the average ground reaction force of the tested limb, and the difference between the average Y Position of the previous and current limb zones is greater than zero; (2) the tested limbzone is of a single limb, the limb before the tested limb is hind, and average ground reaction force of the previous limb is greater than or equal to 1.05 times the average ground reaction force of the current limb and the difference between average Y position of current and previous limbs is greater than or equal to forty; (3) the tested limbzone is of a single limb, the limb before the tested limb is hind, and the difference between average Y position of current and previous limbs is greater than or equal to forty.

30. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 25, wherein the instructions arranged to cause one or more processors upon execution thereof to perform step (f) further comprises an instruction or instructions arranged to designate a

tested limb zone as belonging to a new cow if any one of the following sets of conditions is satisfied: (1) the limb one before current limb is hind, the current limb is fore, the average Y position of the limb before current is greater than the average Y position of the current limb; (2) the limb before the current limb is hind, the current limb is fore, the difference between the start time of the current limb and the end time of the limb before current limb is greater than 0.5 sec; (3) the number of limbs in the tested zone is one, the limb before the current limb is within five inches of the beginning of the plate, and the difference between the average Y position of the limb before the current limb and the average Y position of the current limb is greater than fifteen; (4) the limb before current is hind, the current limb is within about one inch from the front end of the plate, and the average Y position of the limb before the current limb is greater than the average Y position of the current limb.

31. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor, comprising the steps of:

(a) obtaining a data file comprising positional data and ground reaction force data for said plurality of animals traversing an instrumented force-sensing floor;

(b) dividing the positional data into a plurality of time zones, each time zone having a start time and an end time;

(c) determining whether each of said time zones represents positional data and ground reaction force data for a single limb or for multiple limbs;

(d) singulating multiple limb time zones into a plurality of separate single limb time zones;

(e) identifying each limb in each time zone as a fore limb or a hind limb and a left limb or a right limb;

(f) associating each identified fore and hind limb with a respective one of said plurality of animals.

32. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 32, where step (d) comprises singulating multiple limb time zones via induction into a plurality of separate single limb time zones.

33. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 32, wherein step (a) further comprises obtaining identification data comprising at least one of time data for data recordation, file numbers, animal tag numbers, and animal identification numbers.

34. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 33,

wherein step (a) further comprises calculating a number of animals recorded in each file, and

wherein step (b) further comprises finding a first vector of indices for which a Y-position of a right limb or a left limb is greater than zero, finding a second vector of indices for which a Y-position of a right limb or a left limb is greater than one, and utilizing at least one of said first vector of indices and said second vector of indices to determine said plurality of time zones.

35. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 34, wherein step (c) further

comprises determining a maximum and an average ground reaction force between a start time of a tested limb time zone and an end time of a tested limb time zone if the difference between the start time and the end time is greater than about 30 seconds, and storing said maximum and said average ground reaction force.

36. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 35, wherein step (c) further comprises determining said average ground reaction force by calculating a ratio of an impulse variable over a stancetime variable, said impulse variable calculated by applying a multiplier to a ground reaction force curve area defined between said start time of a tested limb time zone and said end time of a tested limb time zone, and said stancetime variable calculated as the difference in time between said start time of a tested limb time zone and said end time of a tested limb time zone.

37. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 36, wherein step (c) further comprises calculating a slope of a running window of Y position values and calculating a maximum slope, a minimum slope, and a respective time of said Y position values.

38. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 37, wherein step (c) further comprises incrementing a counter if the slope of said running window of Y position values is greater than about 2 or less than about -2.

39. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 38, wherein step (c) further comprises incrementing a positive slope counter by one or incrementing a negative slope

counter if a slope within said running window exceeds a predetermined minimum rate of change.

40. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 39, wherein step (c) further comprises iteratively calculating a ground reaction force slope for a second running window having a width less than that of said running window, and incrementing a ground reaction force slope counter by one if the product of two successive ground reaction force slope values are negative.

41. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 40, wherein step (c) further comprises calculating, for a difference in between the start time and the end time is greater than about 30 seconds, average Y position, maximum Y position value, minimum Y position value, maximum ground reaction force, and average ground reaction force.

42. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 41, wherein step (c) further comprises calculating a maximum slope and a minimum slope within a running window and to storing said maximum slope and said minimum slope together with a respective time of occurrence for each of said maximum slope and said minimum slope.

43. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 42, wherein step (c) further comprises assigning a number of limbs in a time zone to be one if at least one of the following sets of conditions is satisfied: (1) a difference between a maximum and a minimum value of Y position is less than six, a difference between a mean value of Y

position and a minimum value of Y position is less than six, said maximum slope is less than five, said minimum slope is greater than negative five, said ground reaction force slope counter is one; (2) said ground reaction force slope counter is one, said maximum slope is greater than or equal to five and the difference in time between said maximum slope and said start time is less than 20 seconds and said minimum slope is greater than negative five; (3) said ground reaction force slope counter is one, said maximum slope is greater than or equal to five, a difference in time between said end time and said time of the maximum slope is less than twenty seconds, and said minimum slope is greater than five; (4) said ground reaction force slope counter is one, said minimum slope is less than or equal to negative five, a difference in time between said end time and said time of the minimum slope is less than twenty seconds, and said maximum slope is less than five; and (5) said ground reaction force slope counter is one, said minimum slope is less than or equal to negative five, a difference in time between said end time and said time of the minimum slope is less than twenty seconds, and said minimum slope is greater than five; and the maximum slope is less than five, (6) said ground reaction force slope counter is one, said minimum slope is less than or equal to negative five, a difference in time between said time of the minimum slope and said start time is less than twenty seconds, and said maximum slope is less than five, and (7) a difference between a maximum value of Y position and the average value of Y position is less than six, a difference between a mean value of Y position and a minimum value of Y position is less than six, said positive slope counter is less than 0.09 times the difference between said start time and said end time, and said negative slope counter is less than 0.09 times a difference between said start time and said end time.

44. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 43, wherein step (c) further comprises assigning a number of limbs in a time zone to be three if a difference between a maximum value of Y position and the average value of Y position is greater than six, a difference between a mean value of Y position and a minimum value of Y position is greater than six, said maximum slope is greater than five, said minimum slope is less than negative five, said positive slope counter is greater than 0.09 times the difference between said start time and said end time, and said negative slope counter is greater than 0.09 times a difference between said start time and said end time.

45. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 44, wherein step (c) further comprises assigning a number of limbs in a time zone to be two if no set of conditions set forth in claim 43 or claim 44 is satisfied.

46. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 45, wherein step (d) further comprises singulating a single ground reaction force signature for two limbs into two ground reaction force signatures for a single limb.

47. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 46, wherein said singulation step further comprises performing a first iterative calculation using a running window starting at the tested limb zone starting time and moving toward the limb zone end time to determine if a difference between a Y position at one end of the running window and a Y position at another end of the running window is greater than a predetermined threshold

value and recording a y-value at the point at which the first interative calculation is terminated, and performing a second iterative calculation using a running window starting at the tested limb zone ending time and moving toward the limb zone start time to determine if a difference between a Y position at one end of the running window and a Y position at another end of the running window is greater than a predetermined threshold value and recording a y-value at the point at which the second iterative calculation is terminated.

48. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 46, wherein said running window is 5 units wide.

49. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 47, wherein said singulation step further comprises solving, for said single ground reaction force signature for two limbs, two simultaneous equilibrium equations to yield two separate ground force reaction signatures for two singulated limbs.

50. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 49, wherein step (d) further comprises singulation of a single ground reaction force signature for three limbs into three ground reaction force signatures for a single limb.

51. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 50, wherein said singulation step further comprises, upon a first instance of singulation, performing a first iterative calculation using a running window starting at the tested limb zone starting time plus a

threshold of two and moving toward and up to a time at which a minimum Y position slope occurs in the tested limb zone minus a threshold of two, calculating an absolute value of a difference between said running window of two units wide and the Y position vector, and terminating said iterative calculation when said difference is less than two, and storing a y-value at the point of said termination of said iterative calculation, and performing a second iterative calculation using a running window starting at the time at which a minimum Y position slope occurs in the tested limb zone minus a threshold of two going backward to the starting time of the limb zone plus a threshold of two, calculating an absolute value of a difference between said running window of two units wide and the Y position vector is evaluated, terminating said second iterative calculation when said difference is less than two, and storing a y-value at the point at which said second iterative calculation is terminated.

52. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 50, wherein said singulation step further comprises initiating a first iterative calculation using a running window starting at the time at which a minimum Y position slope occurs in the tested limb zone plus a threshold of two up to the end time of the limb zone minus a threshold of two, calculating an absolute value of a difference between said running window of two units wide and the Y position vector, terminating said first iterative calculation when said difference is less than two, storing a y-value at the point of said first iterative calculation termination, initiating a second iterative calculation using a running window starting at the tested limb zone end time minus a threshold of two units and moving backward to a time at which a minimum Y position slope occurs in the tested limb zone minus a threshold of two units,

calculating an absolute value of a difference between said running window of two units wide and the Y position vector, terminating the second iterative calculation when said difference is less than two, and storing a y-value at the point of said second iterative calculation termination.

53. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 51 or 52, said singulation step further comprising solving, for said single ground reaction force signature for three limbs, two simultaneous equilibrium equations to yield two separate ground force reaction signatures for two singulated limbs.

54. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 53, said singulation step further comprising solving, for said single ground reaction force signature for three limbs, at least a plurality of simultaneous equilibrium equations to yield a corresponding plurality of separate ground force reaction signatures for singulated limbs.

55. A computer readable medium bearing instructions for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 31, wherein the step (e) further comprises designating the tested limb as a fore limb if a tested limb zone belongs to a single limb and it is the first limb in the data sequence to be tested and to designate the limb data as indeterminate if the tested limb zone is of a single limb and the average Y position is greater than 72 inches end of the plate or if the tested limb zone is of a single limb and the average Y position is less than 1 inch the front end of the plate.

56. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 55, wherein step (e) further comprises delineating a tested limb as a hind limb if any one of the following sets of conditions is satisfied: (1) the tested limbzone is of a single limb, the limb before the tested limb is fore, the limb before the tested limb is not adjacent an end of the plate, the limb before the tested limb is not adjacent a beginning of the plate, the average ground reaction force of the previous limb is greater than or equal to 1.04 times the average ground reaction force of tested limb and the difference between the average Y Position of the previous and current limb zones is less than five; (2) the tested limbzone is of a single limb, the limb before the tested limb is fore, the difference between the average Y Position of the previous and current limb zones is less than ten; (3) the tested limbzone is of a single limb, the limb before the tested limb is fore, the peak ground reaction force of the previous limb is greater 1.15 times the peak ground reaction force of a current limb; and (4) the tested limbzone is of a single limb, the limb before the tested limb is fore and the ground reaction force slope counter of the current zone is greater than three.

57. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 56, wherein step (e) further comprises designating the limb data as belonging to a fore limb if a tested limb zone belongs to a single limb, the limb before the tested limb is fore, the limb before the tested limb is not adjacent the end of the plate, the limb before the tested limb is not adjacent the beginning of the plate, and a difference between the average Y position of the previous and current limb zones is greater than or equal to five.

58. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 56, wherein step (e) further comprises designating the tested limb as a fore limb if any one of the following sets of conditions is satisfied: (1) the tested limbzone is of a single limb and the limb before the tested limb is hind, the limb before the tested limb is not adjacent the end of the plate, the limb before the tested limb is not adjacent the beginning of the plate, the average ground reaction force of the previous limb is greater than 1.05 times the average ground reaction force of the tested limb, and the difference between the average Y Position of the previous and current limb zones is less than or equal to zero; (2) the tested limbzone is of a single limb, the limb before the tested limb is hind, the average ground reaction force of the previous limb is greater than 1.02 times the average ground reaction force of the current limb and the difference between average Y position of current and previous limbs is less than or equal to -15; (3) the tested limbzone is of a single limb, the limb before the tested limb is hind, the average ground reaction force of the previous limb is greater than 1.1 times the average ground reaction force of current limb; and (4) the tested limbzone is of a single limb, the limb before the tested limb is hind, and the peak ground reaction force of the previous limb is greater than 1.1 the peak ground reaction force of the current limb.

59. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 56, wherein step (e) further comprises designating the tested limb as a hind limb if any one of the following sets of conditions is satisfied: (1) the tested limbzone is of a single limb, the limb before the tested limb is hind, the limb before the tested limb is not adjacent the end of the plate, the

limb before the tested limb is not adjacent the beginning of the plate and the average ground reaction force of the previous limb is less than or equal to 1.05 times the average ground reaction force of the tested limb, and the difference between the average Y Position of the previous and current limb zones is greater than zero; (2) the tested limbzone is of a single limb, the limb before the tested limb is hind, and average ground reaction force of the previous limb is greater than or equal to 1.05 times the average ground reaction force of the current limb and the difference between average Y position of current and previous limbs is greater than or equal to forty; (3) the tested limbzone is of a single limb, the limb before the tested limb is hind, and the difference between average Y position of current and previous limbs is greater than or equal to forty.

60. A method for singulating the limbs of a plurality of animals traversing an instrumented force-sensing floor according to claim 55, wherein step (f) further comprises designating a tested limb zone as belonging to a new cow if any one of the following sets of conditions is satisfied: (1) the limb one before current limb is hind, the current limb is fore, the average Y position of the limb before current is greater than the average Y position of the current limb; (2) the limb before the current limb is hind, the current limb is fore, the difference between the start time of the current limb and the end time of the limb before current limb is greater than 0.5 sec; (3) the number of limbs in the tested zone is one, the limb before the current limb is within five inches of the beginning of the plate, and the difference between the average Y position of the limb before the current limb and the average Y position of the current limb is greater than fifteen; (4) the limb before current is hind, the current limb is within about one inch from the front end

of the plate, and the average Y position of the limb before the current limb is greater than the average Y position of the current limb.